

~~61. An electric device according to claim 60, wherein said Pb-free solder is also directly in contact with said substrate.~~

62. An electronic device according to claim 6, wherein said Sn-Bi alloy layer is directly in contact with said lead or directly in contact with a Cu layer in contact with said lead, and said Pb-free solder is directly in contact with said Sn-Bi alloy layer.

63. An electric device according to claim 62, wherein said Pb-free solder is also directly in contact with said substrate.

64. An electronic device according to claim 11, wherein said Sn-Bi alloy layer is directly in contact with said lead or directly in contact with a Cu layer in contact with said lead, and said Pb-free solder is directly in contact with said Sn-Bi alloy layer.

65. An electric device according to claim 64, wherein said Pb-free solder is also directly in contact with said substrate.

66. An electronic device according to claim 19, wherein said Sn-Bi alloy layer is directly in contact with said lead or directly in contact with a Cu layer in contact with said lead, and said Pb-free solder is directly in contact with said Sn-Bi alloy layer.

67. An electric device according to claim 66, wherein said Pb-free solder is also directly in contact with said substrate.

68. An electronic device according to claim 24, wherein said Sn-Bi alloy layer is directly in contact with said lead or directly in contact with a Cu layer in contact with said lead, and said Pb-free solder is directly in contact with said Sn-Bi alloy layer.

69. An electric device according to claim 68, wherein said Pb-free solder is also directly in contact with said substrate.

70. An electronic device according to claim 43, wherein said Sn-Bi alloy layer is directly in contact with said first electrode or directly in contact with a Cu layer on the first electrode, and the solder is directly in contact with the Sn-Bi alloy layer.

71. An electronic device according to claim 70, wherein said solder is directly in contact with the second electrode.

72. An electronic device according to claim 50, wherein said Sn-Bi alloy layer is directly in contact with said first electrode or directly in contact with a Cu layer on the first electrode, and the solder is directly in contact with the Sn-Bi alloy layer.

73. An electronic device according to claim 72, wherein said solder is directly in contact with the second electrode.

74. An electronic device according to claim 51, wherein said Sn-Bi alloy layer is directly in contact with said first electrode or directly in contact with a Cu layer on the first electrode, and the solder is directly in contact with the Sn-Bi alloy layer.

75. An electronic device according to claim 74, wherein said solder is directly in contact with the second electrode.

CI
cont.
76. An electronic device according to claim 59, wherein said Sn-Bi alloy layer is directly in contact with said first electrode or directly in contact with a Cu layer on the first electrode, and the solder is directly in contact with the Sn-Bi alloy layer.

77. An electronic device according to claim 76, wherein said Sn-Bi alloy layer is directly in contact with said first electrode or directly in contact with a Cu layer on the first electrode, and the solder is directly in contact with the Sn-Bi alloy layer.

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78. An electronic device comprising:
a semiconductor device having an electrode structure which comprises a lead and a Sn-Bi alloy layer containing 1-5 wt% Bi which is formed directly on the lead;
and

a circuit board which is connected to the semiconductor device with a solder which is made of Pb-free alloy,

wherein the connection is formed by contacting and soldering the Sn-Bi alloy layer and the solder.

79. An electronic device according to claim 78, wherein the Pb-free solder comprises Sn, Ag and Bi.

80. An electronic device according to claim 78, wherein the Pb-free solder comprises Sn, Ag, Bi and Cu.

81. An electronic device according to claim 78, wherein the connection comprises Sn, Ag, Bi and Cu.

82. An electronic device according to claim 78, wherein the lead is made of an Fe-Ni alloy, and a Cu layer is provided between the lead and the Sn-Bi alloy layer.

83. An electronic device comprising:
a semiconductor device having an electrode structure which comprises a lead and a Sn-Bi alloy layer containing 1-5 wt% Bi which is formed directly on the lead;
and
a circuit board which is connected to the semiconductor device with a solder which is made of a Pb-free alloy,
wherein the connection is formed by soldering during which the solder is initially in contact with the Sn-Bi alloy and subsequently melted, whereby the Sn-Bi alloy is melted and mixed with the solder under heat from the solder.